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# Distributed Generation's Role in Green Power Programs

Distributed Energy Roadshow
Warner Robbins, GA
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# Looking at the Marriage of Distributed Generation and Renewable Energy

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# Electric Industry Produces:

- 67% of all Sulfur Dioxide Emissions
- 40% of all Carbon Dioxide Emissions
- 33% of all Mercury Emissions
- 23% of all Nitrogen Oxide Emissions

Source: EPA National Air Quality and Emissions Trend Report, March 2001

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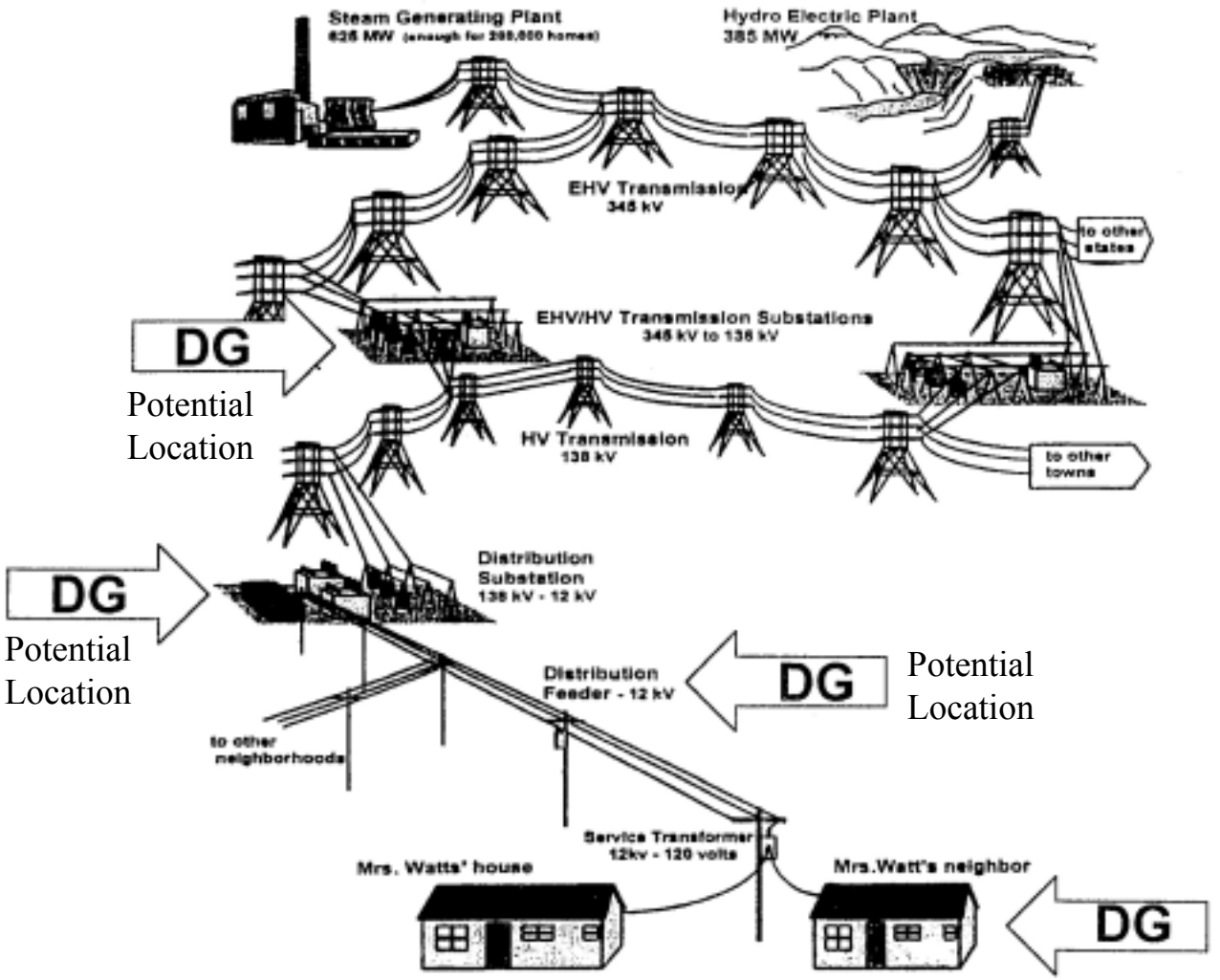


DG = Distributed Generation

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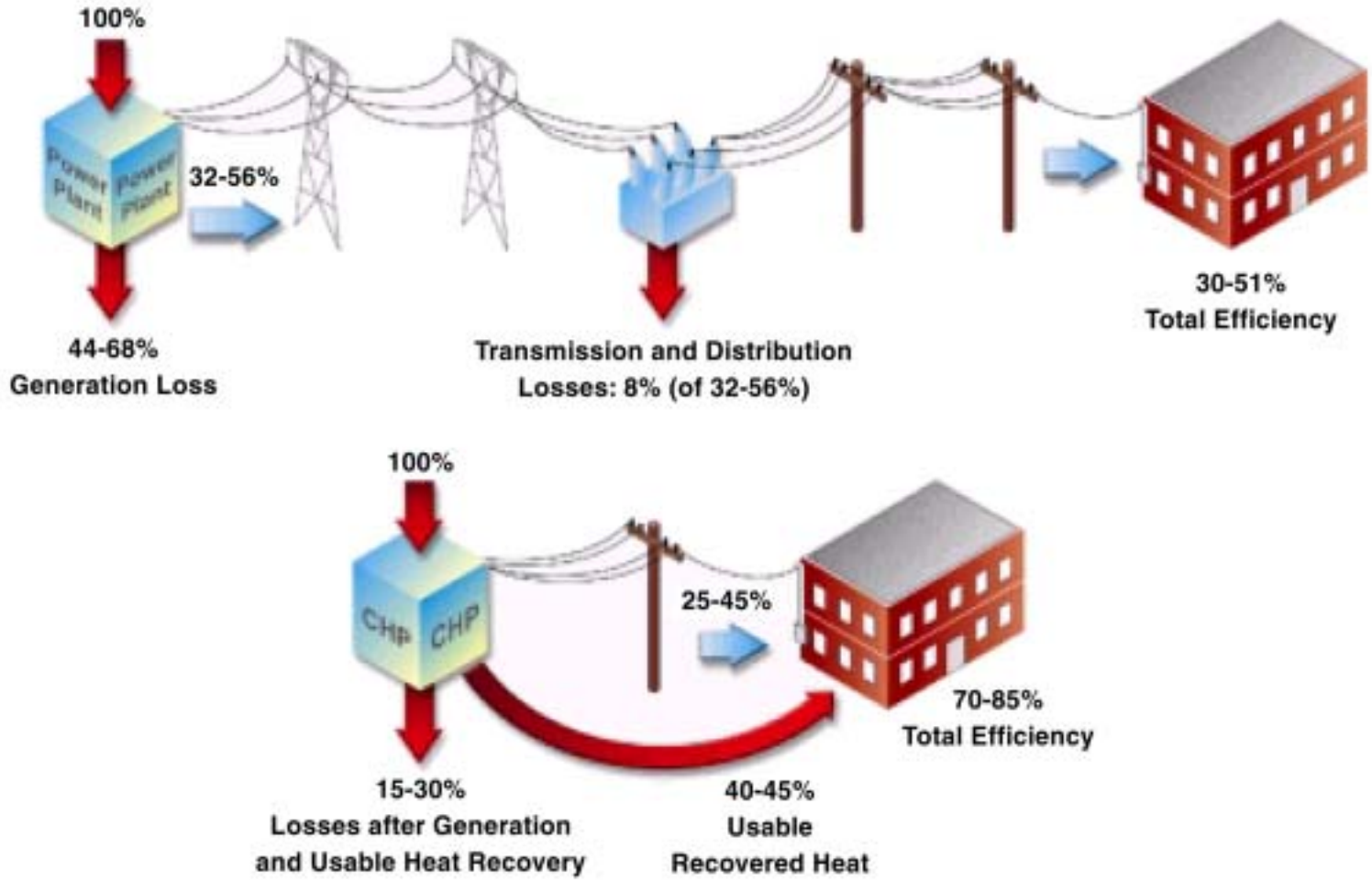
# Central Power Production vs. Distributed Generation




Source: Analysis of CHP Potential at Federal Sites Report
Oak Ridge National Lab, Feb. 2002

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# What is Green Power?

- Electricity generated from renewable fuel sources that is sold to consumers at a premium over existing rates.

- Green Power incorporates health and environmental costs that are currently external to the price of power.

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# Green Power Fuel Sources

- Geothermal
- Ocean Technology
- Low Impact Hydro
- Wind
- Solar
- Biomass

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# Green Power in the U.S.

- 117 Programs in 31 states
- Southeast has:
  - 15 in Tennessee
  - 9 in Florida
  - 2 in Kentucky
  - 2 in Mississippi
  - 1 in South Carolina

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# Solar Energy Systems

- Solar Thermal technology uses radiation from the sun to heat water or another liquid.
- Photovoltaic (PV) technology uses cells in thin silicone film to conduct solar energy to an inverter where it is converted to AC power.

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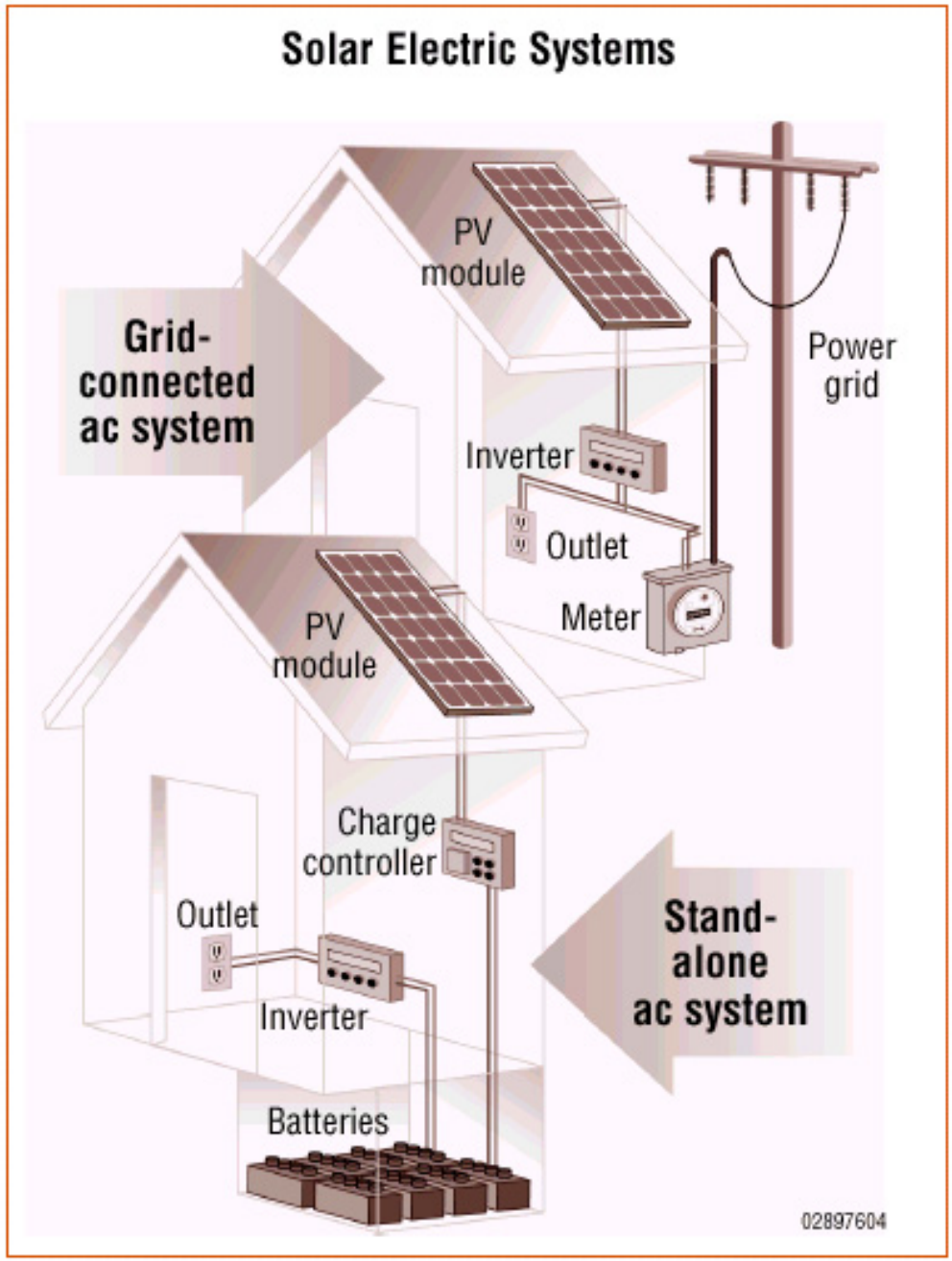

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# Photovoltaic Power Systems

- Provides power during peak periods.
- No emissions.
- Manufacturing costs have fallen 24% in 2001.
- Power costs 24 to 49 cents/kWh without financing.
- 189 programs in 42 states offer financial incentives for solar technologies.

Source: GA Tech and Georgia Power Company

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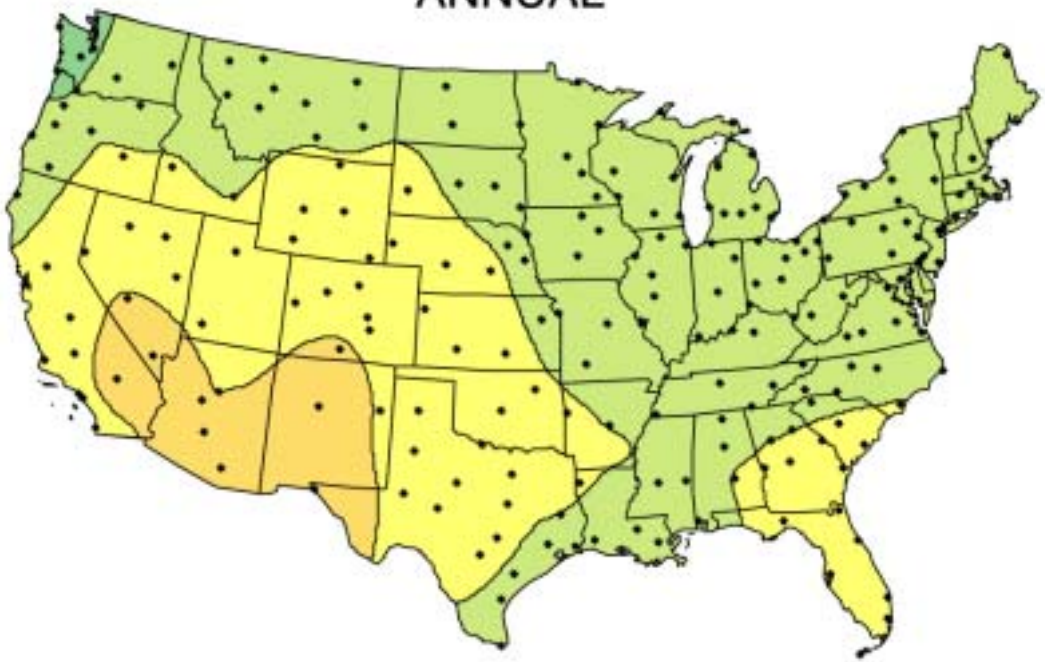
# Average Daily Solar Radiation Per Month

## ANNUAL



kWh/m²/day

| | |
|---|---|
| 10 | to 14 |
| 8 | to 10 |
| 7 | to 8 |
| 6 | to 7 |
| 5 | to 6 |
| 4 | to 5 |
| 3 | to 4 |
| 2 | to 3 |
| 0 | to 2 |
| none | |

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# Examples of TVA Solar PV Sites

| Site | Peak Generating Capacity (kW) | Avg Daily Energy Generated (kWh) |
|---|---|---|
| American Museum of Science | 15 | 70 |
| Cock County High School | 10 | n/a |
| Cumberland Science Museum | 27 | 79 |
| Dollywood | 18 | 90 |
| Duffield Primary School | 9 | 47 |
| Finley Stadium | 85 | 442 |
| Gibson County High School | 18 | 22 |
| Ijams Nature Center | n/a | n/a |
| Lovers Lane Soccer Complex | 36 | 78 |
| Oak Ridge National Lab | 7 | 33 |
| Sci-Quest | 27 | 122 |
| | | |
| TOTAL | 252 | 983 |

Source: U.S. DOE PV Program Technology Overview

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# Biomass Fuels

- Agricultural Residues
  - Nutshells, corn fiber, rice straw and hulls
- Wood Waste
  - Timber slash, mill scrap, sawdust
- Municipal Waste
  - Urban yard clippings, paper trash

Source: American Bioenergy Association Website

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# Biomass Fuels

- Energy Crops
  - Fast growing trees and grasses
- Captured Methane
  - Poultry, cattle and hog manure
  - Landfills
  - Waste water treatment facilities

Source: American Bioenergy Association Website

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# Biofuel Technologies

- Reciprocating Engines
  - 0.5 to 10 MW systems are 37-40% efficient.
  - Can be used with methane from waste treatment facilities or other biofuels.
  - Low greenhouse gas emissions.
  - Exhaust gas treatment systems allow for very low NOx emissions.

Source: U.S. Dept. of Energy's Distributed Energy Resources fact sheet.

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# Biofuel Technologies

- Combustion Turbines
  - Typical applications range from 1 to 20 MW.
  - Can be used with landfill gas or other biomass-derived liquids and gases.
  - Advanced ceramics are being researched and applied to significantly reduce NOx and $CO_2$ emissions.

Source: U.S. Dept. of Energy's Distributed Energy Resources fact sheet.

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# Biofuel Technologies

- Microturbines
  - System size 25 to 500 kW
  - Can be located on sites with limited space
  - Able to use waste fuels such as landfill gas
  - Relatively low noise
  - Low greenhouse gas emissions

Source: U.S. Dept. of Energy's Distributed Energy Resources fact sheet.

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# Methane Recovery Projects

- Landfills generate 37% of U.S. methane emissions
- Over 300 landfills convert gas to energy
- Green Power EMC Sites
  - Richland Creek in Buford: 3.9 MW
  - Roberts Road in Fayette County: 1.3 MW
  - Charing in Taylor County: 2.6 MW

Source: Copeland Corp. Presentation, DG conf. Mar. 2002 and Green Power EMC website.

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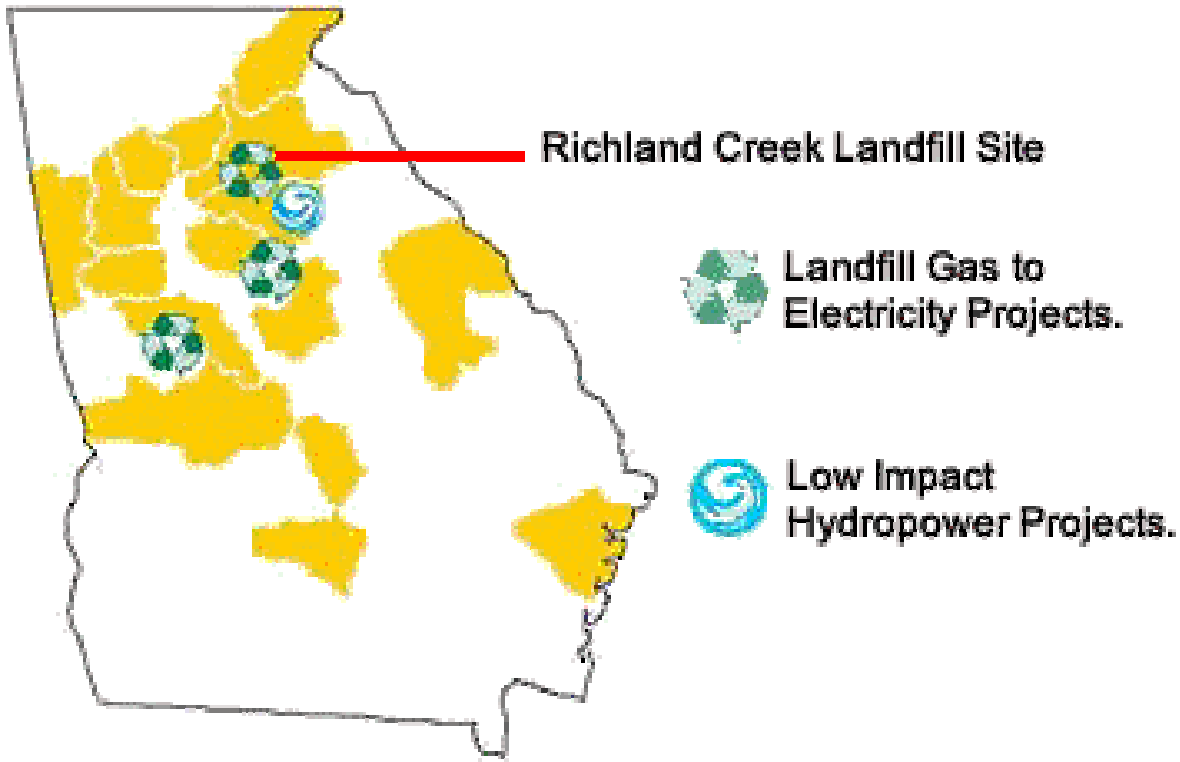
# Green Power EMC




Source: Green Power EMC website.

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# Member Cooperatives of Green Power EMC

- Carroll EMC of Carrollton
- Coastal Electric Cooperative
- Cobb EMC of Marietta
- Coweta-Fayette EMC of Newnan
- Flint Energies of Reynolds
- GreyStone Power of Douglasville
- Habersham EMC of Clarkesville
- Irwin EMC of Ocilla
- Jackson EMC of Jefferson
- Jefferson Energy of Wrens
- Lamar EMC of Barnesville
- Ocmulgee EMC of Eastman
- Sawnee EMC of Cumming
- Snapping Shoals EMC of Covington
- Tri-County EMC of Gray
- Walton EMC of Monroe

Source: Green Power EMC website.

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# Georgia Power Company
# Green Power Program

- Tariff to be submitted to PSC soon for approval.
- Program expected to commence April 2003.
- 13 bidders totaling 100 MW of capacity submitted proposals.
- Capacity purchase undetermined.
- Expected to meet Georgia Green Pricing Accreditation criteria.

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# Georgia Green Pricing Accreditation

- 14 stakeholder organizations achieved consensus on:
  - Resource content
  - Portfolio percentages
  - Biomass air emissions standards
  - Energy and capacity blocks
  - Product pricing
  - Marketing
  - Disclosure